Souphanouvong University Journal of Multidisciplinary Research and Development
2026, Vol. 12, No. 02, 257-265
https://doi.org/10.69692/SUJMRD1202257

Analysis of the Relationship Between Budget Revenue and Economic Growth of Luang Namtha Province

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Article Info:
Submitted: April 08, 2026
Revised: May 18, 2026
Accepted: May 21, 2026

ABSTRACT

This study aims to analysis the relationship between budget revenue and economic growth of Luang Namtha province, which has been collected time series data from 2011-2024, focusing the analysis for relationship as long-run correlation with Johansen's cointegretion method, short-run correlation with Vectors Error Correction Model and cause correlation with granger causality. The results of research:

The long-run correlation shows that the coefficient is positive and rejected null hypothesis (H_0) with a statistical significance level of 0.01, which means that budget revenue (R) and economic growth of Luang Namtha province (GDP) have a positive long-run relationship. When budget revenue increases, it will effect on the long-run on economic growth of Luang Namtha province increases. On the contrary, if budget revenue decreases, it will affect to the long-term economic growth of Luang Namtha province decreases with a confidence level of 99%.

The short-run correlation is show that for the GDP is dependence variable, it is accepted null hypothesis (H_0) with statistical significant level of 0.1 and coefficient is a negative value, this show that the economic growth of Luang Namtha province and budget revenue are related in the short run. For budget revenue (R) is dependence variable show that it is not related in the short-run. Because, the value of coefficient is positive and accepted null hypothesis (H_0).

The results of the causality test between budget revenue (R) and economic growth of Luang Namtha province (GDP) show that the R does not granger cause GDP, there are accepted null hypothesis this means that R does not Cause GDP. For the case GDP does not granger cause R, there are rejected null hypothesis with a significance level of 0.05, which means that budget revenue has granger cause on the economic growth of the Luang Namtha province.

Keywords: Economic growth, Budget revenue, Co-integration, VEC model, Granger causality

1. Introduction

Since 1986, the party and the government have placed strong emphasis on macroeconomic management by implementing various policies and legal frameworks such as national development plans, budget plans, the law on foreign investment, the labor law, the budget law, the insurance law, the enterprise law, and the domestic investment law. Throughout the period of these changes, it was observed that the national economy maintained macroeconomic stability. This is reflected in the economic growth achieved in each period. For instance. Communist Review Magazine. (2024). in 2011 the economy expanded by 8%, with the Gross Domestic Product (GDP) reaching 1.086.131 million kip. The total export value of the province amounted to USD 23.271.600, while total

imports were recorded at USD 35.434.900. In the same year, the province was able to collect a total budget revenue of 33.661,10 million kip. In 2012, the economy was able to expand by **8.3%**, with the Gross Domestic Product (GDP) reaching 1,198,960 million kip. The total value of provincial exports amounted to USD 19.330.740, an increase of 2.26% compared to the previous year and 19.24% above the annual target. The total value of imports reached USD 410,071,901**,** representing a 7.3-fold increase compared to the previous year and a 9-fold increase compared to the annual plan of this amount, imports for domestic consumption and distribution within the province were valued at USD 7,007,430, an increase of 29.61% compared to the previous year and achieving 58.91% of the annual target.Total revenue collection reached 52,440 million kip, equivalent to 98% of the annual plan. This includes:Land and property tax, totaling 49,483 million kip, representing a 4% increase compared to the planned target;State asset**s**, totaling 2,975 million kip, achieving 54% of the annual plan;Natural resources and environmental fees**,** totaling 181 million kip, equivalent to 56% of the planned target. The investment planning department of Luang Namtha Province (2011 and 2012).

In 2013, the economy expanded by 9.2%, with the Gross Domestic Product (GDP) reaching 4,741,000.00 million kip. The total value of the province's exports amounted to USD 39,044,100, an increase of 1.42% compared to the previous year, achieving 111.95% of the planned target. The total value of imports reached USD 251,859,900, representing a 61.41-fold increase compared to the previous year and nine times the annual plan.The province was able to generate total revenue of 106,667.17 million kip, exceeding the annual target by 15%. In 2014, the economy was able to grow by 8.2%, with the total Gross Domestic Product (GDP) reaching 2,129,760 million kip. The investment planning department of Luang Namtha Province (2013 and 2014).

In 2015, the economy expanded by 8.5%, and the total GDP amounted to 2,266,000.00 million kip. In 2016, economic growth reached 8.4%, with total GDP achieving 2,339,000.00 million kip. In 2017, the economy was able to grow by 8.2%, with total Gross Domestic Product (GDP) reaching 2,447,493.59 million kip, equivalent to 95.96% of the annual plan. The investment planning department of Luang Namtha Province (2015-2016 And 2017).

In 2018, the conomy expanded by 8.99%, with total GDP reaching 2,876,740 million kip. Total state budget revenue collection amounted to 494,920 million kip, equivalent to 91.69% of the planned target. In 2019, the economy grew by 8.83%, with total GDP reaching 2,705,300 million kip. Total state budget revenue collection amounted to 380,876 million kip, equivalent to 119.77% of the planned target. The investment planning department of Luang Namtha Province (2018, and 2019).

In 2020, the economy was able to grow by 4.4%, with the Gross Domestic Product (GDP) reaching 7,888,149.95 million kip. Local revenue from exports totaled 530,696.40 kip, achieving 61.37% of the planned target (due to the decline in the export of agricultural– livestock products and mineral resources). In 2021, the Gross Domestic Product (GDP) of the Lao PDR grew by 3.48%, reaching a total value of 184,982 billion kip. The annual plan was set at 129.60 billion kip, with an average planned target of 128.97 billion kip, while the actual implementation for the whole year amounted to 100.95 billion kip, equivalent to 78.27% of the annual plan. For tax administration, the annual plan was 122 trillion kip, with an adjusted plan of 121.37 trillion kip. The total annual implementation reached 90.92 trillion kip, equivalent to 74.91% of the annual plan. For state asset management, the annual plan was 7.60 trillion kip, and the total annual implementation achieved 10.03 trillion kip, equivalent to 131.98% of the annual plan, In 2022, the Gross Domestic Product (GDP) of the Lao PDR expanded by 4.4%, reaching a total value of 215,619 billion kip. Local revenues amounted to 162,860 billion kip, accounting for a growth rate of 14.66%, comprising: provincial and local revenue of 134,170 billion kip with a growth rate of 5.88%, and government-owned assets revenue of 28,670 billion kip with a growth rate of 7.38%. In 2023, the Gross Domestic Product (GDP) of the Lao PDR expanded by 4.2%, with a total GDP value of 265,475 billion kip. In 2024, the GDP of the Lao PDR is projected to grow by 4.3%, reaching a total GDP of 325,287 billion kip. Local revenues were realized at 238.98 billion kip, accounting for 41.42% of the plan, compared to the adjusted plan of 36.14%. Among this, the customs sector achieved 213.20 billion kip, while the

State Treasury managed 25.78 billion kip. The investment planning department of Luang Namtha Province (2020–2024).

For Luang Namtha province, the expansion of economic indicators has generally shown positive growth. However, in some periods, the growth has slowed down when compared across different times, which can be observed from the data.

During 2011–2015, the economic expansion of Luang Namtha Province showed sectoral growth as follows: the agriculture and forestry sector expanded by an average of 7.5% of GDP, the industrial sector grew by an average of 14.1% of GDP, and the services sector increased by an average of 8.7% of GDP. "On average, GDP expanded at an annual rate of 8.7%. The investment planning department of Luang Namtha Province, (2011–2015).

From 2016 to 2020, the agriculture and forestry sector expanded on average by 8.84% of GDP, the industrial sector grew by an average of 7.87% of GDP, and the services sector increased by an average of 3.10% of GDP. Overall, GDP recorded an average annual growth rate of 8.56%, achieving 90.11% of the planned target. Compared with the past five-year plan, this represents a slight decrease of 0.14%. The outbreak of the COVID-19 pandemic, however, caused a greater impact on the services sector than on other sectors. Luang Namtha Provincial Governor's Office, (2021).

During 2021–2025, the agriculture and forestry sector expanded on average by 8.90% of GDP, the industrial sector grew by an average of 3.00% of GDP, and the services sector increased by an average of 6.00% of GDP. Overall, GDP grew at an average annual rate of 6.20%, exceeding the planned target of 0.70% (the 5-year plan projected 5.50%). This represents a decrease of 2.36% compared to the previous five-year period, reflecting the impact of the COVID-19 pandemic in the latter part of the period, while the industrial sector is gradually recovering. The investment planning department of Luang Namtha Province, (2021–2025). Therefore, this research is to analyze the relationship between budget revenue and economic growth of Luang Namtha Province.

2. Materials and Methods

2.1 Data collection

The data used in this study consist of two types, covering the period from 2011 to 2024. The government budget revenue data were collected from the finance department of Luang Namtha province, while the data on economic growth (GDP) were collected from the planning and investment department of Luang Namtha Province.

2.2 The analysis method

This study will use quantitative data, specifically time-series data collected from the finance department and the planning and investment department of Luang Namtha province. The study aims to examine the relationship between budget revenue and economic growth in Luang Namtha province. The analysis will apply econometric methods, including both short-run and long-run relationship tests. The long-run relationship will be tested using the Cointegration approach, while the causality between variables will be examined using the Granger causality method within the framework of the Vector Error Correction Model (VECM).

1) **Regression analysis**

Regression analysis is a statistical method used to study the relationship between two or multiple variables. The purpose of regression model is to estimate parameter values in a model. Once the estimates are obtained, they can be tested to determine whether the model is appropriate for the data. Regression model is an essential part of quantitative research and is used to address research problems.

In this study, the variables used in the regression analysis include the gross domestic product (GDP) of Luang Namtha province as the dependent variable (Response Variable) and the provincial budget revenue (R) as the independent variable (Predictor). These variables can be modeled using the following regression model:

$$GDP_t = \beta_0 + \beta_1 R_t + \varepsilon_t \text{ ……..(1)}$$

GDP_t is the gross domestic product (GDP) of Luang Namtha province.

R_t is the budget revenue of Luang Namtha province.

β_0 is the constant term of the regression.

β_1 is the coefficient of (R) variable.

ε_t is standard error term.

t: The period under study is from 2011 to 2025.

The hypothesis for test:

$H_0 : \beta_i = 0$ ((Independent variable that has no relationship with the dependent variable)

$H_1 : \beta_i \neq 0$ (Independent variable that may have a relationship with the dependent variable)

β_i It refers to the expected parameter value **or** estimated value.

i It is number parameter**.**

The statistics used in the testing for the analysis are t-statistics

$$t = \frac{\beta_i}{s_{\beta_i}} \text{.....(2)}$$

If $t\text{-statistic} > t_{(n,k-1;\alpha//2)}$, it is rejected null hypothesis (H_0) with a statistical significance level of α can be rejected and H_1 accepted**,** meaning that the independent variable has an effect on the dependent variable.

If the $t\text{-statistic} < t_{(n,k-1;\alpha//2)}$, it is accept null hypothesis (H_0) with a statistical significance level of α can be rejected and H_1 accepted, the meaning that independent variable no effect on the dependent variable.

Simultaneous Testing of all independent variables: Simultaneous testing of all independent variables involves examining the significance of all variables obtained from estimated regression results at once to verify whether the significance of the estimated independent variables derived from the sample can be statistically explained. This type of test is primarily applied in cases where the regression involves multiple independent variables (i.e., multiple regression model).

2) Short-run correlation

In the short run, the analysis of the relationship between budget revenue and economic growth of Luang Namtha province in this study employs the Granger Causality Test within the Vector Error Correction Model (VECM) framework (Granger, 1969). The VECM model used in the analysis is specified as follows:

$$GDP_t = \sum_{i=1}^{p} \alpha_{11,i} R_{t-i} + \sum_{j=1}^{p} \alpha_{12,j} GDP_{t-j} + \varepsilon_t \text{ ....}$$

(3)

$$R_t = \sum_{i=1}^{p} \beta_{11,i} GDP_{t-i} + \sum_{j=1}^{p} \alpha_{12,j} R_{t-j} + u_t \text{ .....(4)}$$

The hypotheses for the causality test are:

H_0: The independent variables and the dependent variable do not have any effect on each other.

H_1: The independent variables and the dependent variable have a significant effect on each other.

For acceptation or reject null hypothesis (H_0). If $p-value(F) < 0.05$, there is an accepted null hypothesis (H_0) with a statistical significance level of 0.05, if $p-value(F) < 0.05$, there is rejected null hypothesis (H_0) with a statistical significance level of 0.05.

In the case of multivariate causality testing, the Granger causality approach (Granger, 1969) is extended using the Vector Error Correction Model (VECM**)**, which allows for testing causality among multiple variables within a single system. This method examines short-run causality following the approach of Johansen and Juselius (1990) and evaluates the significance of the error correction term (ECT) to determine the long-run adjustment toward equilibrium, following the framework developed by Engle and Granger (1987). The causality equations in the VECM are represented as:

The short-run causality test aims to examine whether budget revenue (R) causes the economic growth of Luang Namtha province (GDP), or whether the economic growth of Luang Namtha province (GDP) causes the budget revenue (R).

$$\Delta GDP_t = \beta_0 + \beta_{1j} \sum \Delta GDP_{t-j} + \beta_{2j} \sum \Delta R_{t-j} + \varphi ECT_{t-1} + u_t \text{ .....(5)}$$

From Equation (4), the hypotheses for testing are stated as follows:

H_0 **:** The independent variable does not Granger-cause the dependent variable.

H_1 **:** The independent variable does Granger-cause the dependent variable.

Where: The dependent variable is GDP_t and the independent variable is TR.

For the acceptance or rejection of the null hypothesis (H_0), if the value of p-value **is** greater than the significance level, the null hypothesis H_1 is accepted at the statistical significance level of 0.05. If the p-value **is** less than the significance level of 0.05, the null hypothesis is rejected with a statistical significance level of 0.05.

3) Long-run correlation

The long-run relationship is examined by applying the Johansen and Juselius (1990) cointegration technique to test for long-run equilibrium between the independent and dependent variables. The procedure includes the following steps:

(1) Testing the goodness of fit model

The suitability of the model is assessed based on the order of integration of the variables in the model, which may have different or identical integration orders. After determining the order of integration of each variable, the optimal lag length of the model is selected.

In this study, the lag length is chosen based on the Schwarz Information Criterion (SIC). The lag order with the lowest SIC value is selected as the optimal lag for estimating the model.

The SIC is calculated using the formula:

$$SIC = T\log\left|\sum^{2}\right| + \log N/T \quad \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

T : Number of usable observations.

k : Total number of estimated parameters in all equations.

$\left|\sum^{2}\right|$: Determinant of the variance–covariance matrix of the residuals.

(2) Determining the rank of (π) or the number of cointegration vectors (r)

The rank of matrix (π) represents the number of characteristic roots that are different from zero. There are three possible cases:

- **Full rank:** rank(π)= n, all variables are stationary (I(0)).
- **Zero rank:** rank(π)= 0, all variables are non-stationary and contain unit roots.
- **Reduced rank:** rank(π)= r with 0 < r < n, there exist r cointegration vectors.

The statistical tests used to determine the number of cointegration vectors are the Trace **test** and the Maximum eigenvalue test**,** as follows:

Trace test: $\lambda trace(r) = -T\sum_{i=r+1}^{n}\ln(1-\hat{\lambda}_r)$ ..... (7)

Maximum eigenvalue test:

$$\lambda\max(r, r+1) = -T\ln(1-\hat{\lambda}_{r-1}) \ldots\ldots (8)$$

T : Number of observations

λ_i : The *i-th* largest eigenvalue of matrix (π).

The hypotheses for the Trace test are:

H_0: The number of cointegration vectors ≤ r

H_1: The number of cointegration vectors > r

If the Trace statistic is less than the 0.05 critical value, H_0 is accepted**.**

If the Trace statistic is greater than the 0.05 critical value, H_0 is rejected**.**

The hypotheses for the Maximum eigenvalue test are:

H_0: The number of cointegration vectors ≤ r

H_1: The number of cointegration vectors > r + 1

If the Maximum eigenvalue statistic is less than the 0.05 critical value**,** H_0 is accepted**.**

If the Maximum eigenvalue statistic is greater than the 0.05 critical value, H_0 is rejected**.**

3. Results

3.1 Results of Long-Run Correlation Using the Johansen Method

The unit root test of the data and the examination for multicollinearity problems show that both GDP and R possess good statistical properties; that is, they are stationary and do not exhibit multicollinearity problems. Based on these results, the variables are then used for further analysis according to the research objectives.

The analysis using the multiple regression model with the Ordinary Least Squares (OLS) method yields the results shown in the table below:

From table 1. The lags for goodness of fit model is 1 (lag=1)

From the table 2: the cointegration rank of Trace and Maximum Eigenvalue statistic show that: The trace statistic test is accepted the null hypothesis at H_1: r > 0 and Maximum Eigenvalue statistic test is accepted the

null hypothesis at H_1: r =1 with statistical significance level of 0.05. This means that cointegration rank is equal to 1 (r =1) or There is 1 equation for cointegration likes table 3.

From table 3, the cointegrating equation likes:

$$\varepsilon_t = GDP_t - 59.35146R_i \quad Or \quad GDP_t = 59.35146R_i + \varepsilon_t \ldots\ldots\ldots\ldots(9)$$
$$(12.8193)*** \qquad\qquad (12.8193)***$$

From table 3 and equation 9. The result shows that the coefficient is positive and rejects the null hypothesis with a statistical significance level of 0.01, which means that budget revenue and economic growth of Luang Namtha province have a positive long-run relationship. When budget revenue increases, it will effect on long-run economic growth of Luang Namtha province increases

3.2 The results of the short-run correlation

From table 4 show that it is rejected null hypothesis (H_0) with statistical significant level of 0.1 and coefficient is a negative value. This means th GDP and R are related in the short run.

From table 5 show that it is accepted null hypothesis (H_0) and coefficient is a positive value. This means the GDP and R are not related in the short-run.

3.3 The Granger causality results

From the table 6, The results of the causality test between budget revenue (R) and the Gross

domestic product (GDP) of Luang Namtha province show that the (R) does not granger cause (GDP), there are accepted null hypothesis, this means that R does not granger cause GDP. For the case (GDP) does not granger cause (R), there are rejected null hypothesis with a statistical significance level of 0.05, this means the budget revenue (R) has granger cause on the gross domestic product of Luang Namtha province (GDP).

4. Discussion

The analysis results show that the coefficients are positive and statistically significant at the 0.01 level. This means that the total revenue and economic growth of Luang Namtha Province have a positive correlation over time. When total revenue increases, it will lead to an increase in economic growth in the long term, consistent with the research by (Castro & Camarillo 2014) Their findings indicate that the total government revenue and gross domestic product (GDP) within OECD countries are positively correlated and consistent with the research by Canicio & Zachary, (2014) The research shows that government total revenue and GDP are positively correlated and have a similar causal relationship.

In the case where GDP is the variable, the analysis shows that the null hypothesis (H0) at the significance level of 0.1 cannot be rejected, and the p-value is greater than 0.1. This indicates that there is a short-term correlation between GDP and total revenue, but this correlation is negative. This finding is consistent with Engle and Granger (1987), Is Stock Prices and Economic Activity in India Co-Integrated?. who stated that in the short term, adjustments in the economic system may cause disturbances, and the impact may not be synchronized with the long-term trend.

Additionally, this also aligns with Keynes, (1936), who explained that fiscal policy and government spending might have a delayed effect on economic growth due to policy lag and constraints in short-term policy implementation. Simultaneously, when R (total revenue) is the variable, the analysis finds that the null hypothesis (H0) at the significance level of 0.1 cannot be rejected, and the p-value is greater than 0.1. This means that GDP and R have no short-term correlation. This result supports Peacock and Wiseman (1961), the Growth of public expenditurein the United Kingdom. who indicated that adjustments in government revenue tend to occur over a longer period than in the short term.

The Granger causality test results indicate that total revenue (R) does not Granger cause GDP of Luang Namtha Province, as the null hypothesis of no causality cannot be rejected. However, in the case where GDP does not Granger cause R, the null hypothesis is rejected at the 0.05 significance level, which means that GDP is Granger cause of R in Luang Namtha Province. Amphone ADHAN, (1987),

Therefore, this study indicates that the relationship between GDP and total revenue in the short term is not

statistically significant and depends on variables that are commonly observed in macroeconomic indicators.

5. Conclusion

Through the analysis results of the budget revenue (R) and the economic growth of Luang Namtha province (GDP) can be summarized as follows:

The results shows that the coefficient is positive and rejects the null hypothesis with a statistical significance level of 0.01, which means that budget revenue and economic growth of Luang Namtha province have a positive long-term relationship. When budget revenue increases, it will effect on long-term economic growth of Luang Namtha province increases. on the contrary, if budget revenue (R) decreases, it will affect to the long-term economic growth of Luang Namtha province (GDP) decreases with a confidence level of 99%.

The short-run correlation is show that for the GDP is dependence variable, it is rejected null hypothesis (H_0) with statistical significant level of 0.1 and coefficient is a negative value. This means GDP and R are related in the short run. For budget revenue (R) is dependence variable, it is not related in the short run, Because the value of coefficient is positive and accepted null hypothesis (H_0).

The results of the granger causality test between budget revenue (R) and the gross domestic product (GDP) of Luang Namtha province show that the (R) does not granger cause on (GDP), there are accepted null hypothesis, this means that R does not granger cause on GDP. For the case (GDP) does not granger cause (R), there are rejected null hypothesis with a statistical significance level of 0.05, this means the budget revenue (R) has granger cause on the gross domestic product of Luang Namtha province (GDP).

6. Conflict of Interest

I hereby declare to all parties that all the information contained in this document has no conflict of interest with any party whatsoever. In the event of any violation in any form, I alone shall be fully responsible.

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Table 1. The results of lags for goodness of fit model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-405.2670	NA	6.35e+22	58.18100	58.27230	58.17255
1	-385.4658	31.11627*	6.73e+21*	55.92368*	56.19756*	55.89833*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

Table 2: Cointegration Rank (Trace and Maximum Eigenvalue)

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
$H_0: r = 0,\ H_1: r > 0$	0.583485	30.86334	15.49471	0.0021
$H_0: r = 1,\ H_1: r > 1$	0.234710	3.477509	3.841466	0.0622

Trace test indicates no cointegration at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
$H_0: r = 0,\ H_1: r = 1$	0.583485	26.38583	18.26460	0.0035
$H_0: r = 1,\ H_1: r = 2$	0.234710	3.477509	3.841466	0.0622

Max-eigenvalue test indicates no cointegration at the 0.05 level

Table 6: Results of the granger causality between GDP and R

Null Hypothesis:	Obs	F-Statistic	Prob.
R does not Granger Cause GDP	13	0.95468	0.4248
GDP does not Granger Cause R		8.16188	0.0473

Table 3: The results of R on GDP a long-run correlation

1 Cointegrating Equation(s):	Log likelihood	-354.5502

Normalized cointegrating coefficients (standard error in parentheses)

GDP	R
1.000000	-59.35146
	(12.8193)

Table 4: The short-run correlation for GDP is a dependence variable

Dependence variable: d(GDP)

	Coefficient	Std. Error	t-Statistic	Prob.
EGM1	-0.672783	0.322185	-2.088188	0.0664
GDP(-1)	1.085015	0.295174	3.675847	0.0051
R(-1)	-17.70093	16.32408	-1.084344	0.3064
C1	782240.5	530661.5	1.474085	0.1746
R-squared	0.695034			
Adjusted R-squared	0.593378	Prob(F-statistic)		0.010700
Log likelihood	-202.0951			
F-statistic	6.837154	Durbin-Watson stat		2.195676

Table 5: The short-run correlation for R is a dependence variable

Dependence variable: d(R)

	Coefficient	Std. Error	t-Statistic	Prob.
C(5)	0.006378	0.009728	0.655655	0.5284
C(6)	-0.023352	0.008913	-2.620119	0.0278
C(7)	0.215229	0.492901	0.436658	0.6726
C(8)	18242.79	16023.16	1.138527	0.2843
R-squared	0.482045			
Adjusted R-squared	0.309393	Prob(F-statistic)		0.101494
Log likelihood	-156.5940			
F-statistic	2.792007	Durbin-Watson stat		2.007233